USDA National Agroforestry Center

AGROFORESTRY NOTES

AF Note — 39

May 2008

Conducting landscape assessments for agroforestry

Purpose

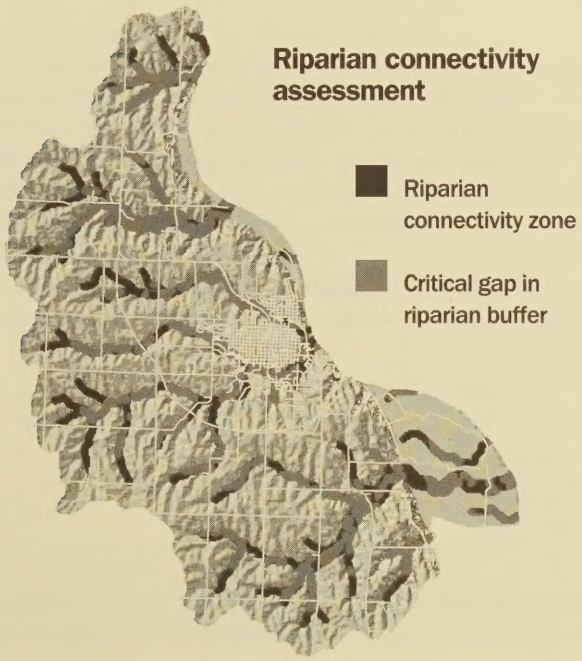
Landscape assessments describe existing resource conditions and trends within a larger planning area and identify opportunities to produce environmental benefits with strategically placed management activities, including agroforestry practices. In this Agroforestry Note, we:

- Explain why assessing the landscape is important for agroforestry
- Describe a basic landscape assessment process
- Discuss ways to use landscape assessments for agroforestry

Why assess the landscape?

Landscape assessments provide a way to understand the relationships between landscape structure, environmental problems, and agroforestry opportunities. Landscape structure influences the sources and movement of organisms, water, air, and materials across the landscape (see AF Note – 38). By understanding the sources and flows of these things, landscape structure can be modified with agroforestry practices to produce environmental benefits that can only be produced at the landscape scale such as improving water quality in a watershed or linking habitat patches with a wildlife corridor.

Tree-based systems like agroforestry take time before the benefits start to accrue. Consequently, it is critical to locate agroforestry in appropriate locations without trial and error. In some cases, agroforestry practices may also create negative impacts such as excessive woody debris in streams or



This landscape assessment identifies critical gaps in riparian vegetation that could be restored with riparian forest buffers to improve connectivity for wildlife movement and to minimize unfiltered runoff from reaching a stream.

A riparian connectivity zone is a continuous segment of riparian vegetation.

A critical wildlife gap is a break in riparian vegetation that exceeds the distance that a particular species can cross.

A gap in riparian vegetation that is adjacent to an agricultural field may pass unfiltered runoff directly to a stream.

For more information:
http://www.unl.edu/nac/research/2004ripariannconnectivity.pdf

nuisance wildlife. Assessments can be used to identify where potential problems might occur so they can be avoided or minimized while maximizing environmental benefits. Assessments provide a way to target limited resources on areas that have a higher probability for success.

Landscape assessments

Assessments identify key resource conditions in a landscape:

- Problems and where they occur
- Opportunities and where they occur
- Sources and causes of the problems
- Where and how resources flow across the landscape
- Structure of the landscape and how it controls sources and movement

Myth-buster

Targeting landowners can be done legally within government programs by contacting a landowner, as long as access is not denied to any other eligible participants.

In addition, assessments that are repeated can be used to follow trends or changes in these conditions over time. A process for conducting landscape assessments is provided on the adjacent page. Links to data sources and example assessments can be found at the end of this note. Reviewing existing assessments can provide useful ideas for conducting your own assessments.

Often, several assessments are necessary to adequately identify problems and ways to address them. For instance, one assessment may determine nitrate source areas and flow pathways that are contributing to a surface water quality problem. Another assessment might identify locations where riparian forest buffers are most effective at filtering and treating nitrate from runoff. By overlaying or merging these two assessments together, the composite assessment can identify locations where nitrate runoff is a greater problem and where buffers will be a more effective mitigation measure.

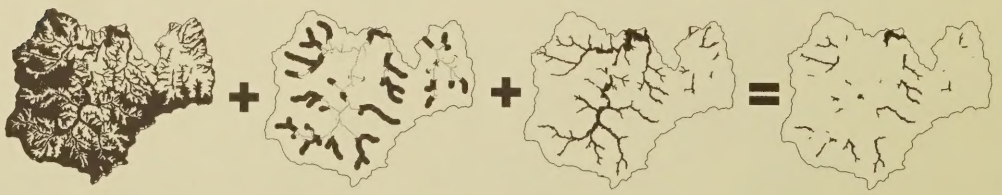
Using landscape assessments

Assessments are a key step in developing a landscape or watershed plan that can serve as a coordinated roadmap for planning conservation practices (see AF Note – 20). You can also target practices to landowners whose properties were identified in the assessments as the most suitable or critical areas for conservation. Targeting landowners is particularly important for environmental benefits that require the installation of practices at specific locations across the landscape in order to achieve a significant, large-scale impact.

If a landscape or watershed plan is not developed, assessments can still be used when a landowner comes into an agency office for conservation assistance. Assessments can be used to determine if the landowner's objectives can be effectively achieved on their property. By placing the property into the larger landscape context, the assessments may reveal a need to coordinate efforts with other landowners in order to achieve those objectives. Assessments may also indicate other objectives that could be achieved on the property that the landowner may not have initially considered.

Achieving multiple objectives

Landscape assessments can help to produce environmental benefits with even greater efficiency by identifying locations where multiple objectives can be accomplished simultaneously. At these



Sediment trapping for water quality

Riparian connectivity for wildlife

Decorative woody florals for markets

Locations where all three objectives can be met

Conducting a landscape assessment

The basic landscape assessment process is a straightforward method that can be applied to any resource condition.

1. **Identify a question you want to answer with the assessment.** For example:

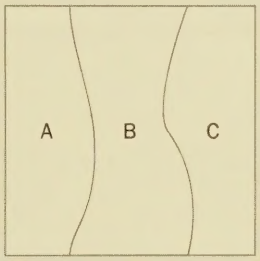
   - What areas are contributing to the majority of the water quality problems?
   - Where can agroforestry be used to connect habitat patches?
   - Where can certain agroforestry specialty products be grown?

   AF Note-40 can be used to develop assessment questions. Questions can also be developed through stakeholder input.

2. **Identify data variables.** Identify the important human, biotic, and abiotic variables that will help you answer the question. Human variables may include proximity to markets or processing mills for harvested products. Biotic variables can include vegetation and wildlife habitat while abiotic variables may consist of soils, hydrology, and topography to name a few. Refer to other Agroforestry Notes for ideas on important data variables to consider.

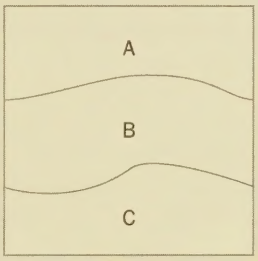
   Our example question can be answered by slope and soil drainage.

3. **Map data variables.** Divide the data into appropriate levels that facilitate the ranking process in step 4.



Slope map

A 0 to 3%
B 4 to 9%
C 10 to 15%



Soil drainage map

A Excessively drained
B Well drained
C Poorly drained

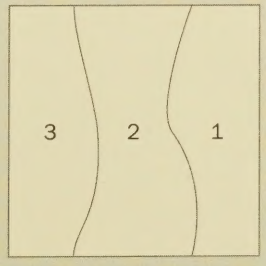
4. **Developing ranking criteria** for each variable according to how it answers the question.

Slope		
A	B	C
3	2	1

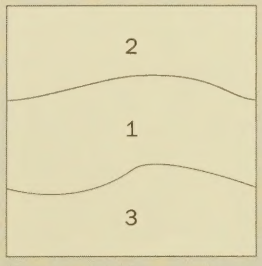
Soil drainage		
A	B	C
2	3	1

3 – High suitability
2 – Moderate suitability
1 – Low suitability

5. **Map the rankings for each variable.**



Slope map



Soil drainage map

6. **Overlay the maps to obtain composite rankings.**

Using GIS, it is a simple process to add up the rankings to get a summary score. Highest numbers indicate best suitability to answer our example question.

locations, agroforestry can generate more benefits from each installation. To find them, simply overlay the individual assessments and determine where different objectives can be addressed at the same locations.

Getting started

Although you may not have the time or resources to personally conduct landscape assessments, check with your local resource agency or planning organization to see if there are GIS specialists who can assist you with the assessment process. See below for examples of assessments. Data for conducting landscape assessments is usually available from state-operated GIS clearinghouses. Landscape assessments are best developed with participation from a variety of resource experts and stakeholders. Once assessments are completed, they can be used repeatedly to assist many planning and design efforts.

Additional information

Instructional books

GIS for Landscape Architects by K. Hanna, 1999. ESRI Press.
Managing Natural Resources with GIS by L. Lang, 1998. ESRI Press.
GIS for Environmental Management by R. Scally. 2006. ESRI Press.

Related Agroforestry Notes

AF Note – 20: Planning Agroforestry Practices. USDA National Agroforestry Center.
AF Note – 38: Landscape Planning for Environmental Benefits. USDA National Agroforestry Center.
AF Note – 40: Guidelines for Fitting Agroforestry into the Landscape. USDA National Agroforestry Center.

Example assessments

Agroforestry Product Assessments – http://www.unl.edu/nac/research/2002agroforestrygis.pdf
Riparian Connectivity Assessment – http://www.unl.edu/nac/research/2004ripariannconnectivity.pdf
Water Quality Assessment – http://www.unl.edu/nac/research/2006soilsurveys.pdf

Spatial data sources

Geospatial One Stop – http://gos2.geodata.gov/wps/portal/gos
National Geospatial Data Clearinghouse – http://clearinghouse1.fgdc.gov/
USDA Geospatial Data Gateway – http://datagateway.nrcs.usda.gov/

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A partnership of

USDA Forest Service
NRCS Natural Resources Conservation Service

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The USDA National Agroforestry Center (NAC) is a partnership of the Forest Service (Research and Development and State and Private Forestry) and the Natural Resources Conservation Service. It is administered by the Forest Service, Southern Research Station; its program manager and headquarters are located in Huntsville, AL, on the campus of Alabama A&M University, while its research, clearinghouse, and technology transfer staff are concentrated in Lincoln, NE, at the University of Nebraska. NAC's purpose is to accelerate the development and application of agroforestry technologies to attain more economically, environmentally, and socially sustainable land use systems. To accomplish its mission, NAC interacts with a national network of partners and cooperators to conduct research, develop technologies and tools, establish demonstrations, and provide useful information to natural resource professionals.